

REMARKS

Claims 1-9 and 11-31 are pending in the present application.

The present invention as set forth in **Claim 1** relates to a process for producing a three-dimensional object, comprising:

- a) providing a layer of pulverulent substrate, wherein the pulverulent substrate contains about 0.05 to about 5% by weight of a flow aid,
- b) selectively applying at least one microwave-absorbing first susceptor to one or more regions of the substrate, wherein the one or more regions are selected in accordance with a cross section of the three-dimensional object, wherein the first susceptor comprises a member selected from powders of metals or metal compounds, ceramic powders, graphite, activated charcoal, or one or more protic liquids selected from saturated monohydric linear aliphatic alcohols, polyhydric linear aliphatic alcohols, monohydric branched aliphatic alcohols, polyhydric branched aliphatic alcohols, monohydric cyclic aliphatic alcohols or polyhydric cyclic aliphatic alcohols, each undiluted, or in a mixture with water,
- c) treating the layer at least once with microwave radiation, to melt the one or more regions containing the first susceptor to the layer of pulverulent substrate, and, optionally, to melt the one or more regions containing the first susceptor with other regions located in one or more substrate layers situated thereunder, thereabove, or combinations thereof, wherein, said other regions optionally contain a microwave-absorbing second susceptor, and wherein said first susceptor and said second susceptor are the same or different, and
- d) cooling the layer.

Applicants respectfully submit that Dorscher et al and Lause et al, even when taken together with newly cited Zhu et al, Wills et al, Narang et al, Sherwood, van der Geest, and Liu et al, do not affect the patentability of Claim 1 or the claims dependent therefrom.

The rejection of Claims 1-5, 8, 9, 12-14, and 26-31 under 35 U.S.C. §103(a) over Dorscher et al in view of Lause et al and either Zhu et al or Wills et al is respectfully traversed.

As set forth in the response filed on July 23, 2008, Droscher et al discloses a method of generating prototypes, by exposing selected regions of pulverulent layers to a focused microwave beam. The controlled microwave beam bonds the exposed pulverulent substrates within a layer, and also bonds these substrates to the pulverulent substrates in the layer situated thereunder. Bonding takes place via adhesive bonding, sintering, or fusion. This process also requires complicated technology in order to ensure that the microwave radiation reaches only the selected regions.

In the present invention, the inventors were able to provide a simplified method that would be able to be performed by simple microwave radiation means (e.g., a microwave oven found in most kitchens). The improvement in the present invention over the state of the art represented by Droscher et al lies in the specific selective application of one or more microwave-absorbing susceptors to one or more regions of the substrate. Thus, whereas the pulverulent substrate absorbs microwave radiation only poorly or not at all, the susceptor(s) absorbs the radiation and passes the energy absorbed in the form of heat to the substrate surrounding the susceptor(s). In the present invention, the susceptors are described on page 14, lines 3-16 as including: pulverulent substances, e.g., metal powders, metal compounds, ceramic powders, graphite, carbon black, activated charcoal, water or protic liquids selected

from the group consisting of saturated mono- or polyhydric linear, branched, or cyclic aliphatic alcohols, or mixtures thereof, each undiluted, or mixed with water (see also previously pending Claim 10).

As recognized by the Examiner, Droscher et al do not explicitly teach selectively applying at least one microwave-absorbing first susceptor to one or more regions of a substrate. However, the Examiner references column 5, lines 9-12 of Droscher et al as disclosing the use of water as a thermal transmitter to improve heat flow.

The Examiner cites Lause et al as disclosing applicant of at least one microwave absorbing first susceptor (e.g., carbon black) to one or more regions of a substrate. Accordingly, the Examiner concludes that it would have been obvious to combine the disclosures of Droscher et al and Lause et al “principally in order to generate sufficient heat to fuse the particulate material and form the desired product.” The Examiner also cites *KSR International Co. v. Teleflex Inc.*, 550 U.S.____, 82 USPQ2d 1385 (2007) and alleges that “the substitution of one known material (i.e., a thermal transmitter such as carbon black) for another known material (i.e., a thermal transmitter such as water) would have yielded predictable results (e.g., thermal transmission when a material is heated by a microwave source, as taught by both Droscher et al and Lause et al) to one of ordinary skill in the art at the time the inventions was made.” Applicants disagree.

It should again be noted that Lause et al only use the term “water” in the following sentence appearing at column 8, line 68 to column 9, line 4: “Such lenses are typically made from poly(methyl methacrylate) by adhesively bonding appropriately colored and water-white lens components, but the resulting adhesively bonded structure is weaker than one which is M-welded.” Certainly this disclosure of Lause et al with respect to water is inconsistent with the use of water as “a thermal transmitter for improving heat flow.”

Similarly, Droscher et al disclose the use of water only in a very limited capacity. Specifically, Droscher et al only disclose the use of water at column 5, lines 9-12 stating “In substrates which are not attacked by water, water adhering can act as a thermal transmitter and thus further improve the heat flow.” It should be noted that at column 5, lines 7-9, and column 5, lines 65-67, Droscher et al specifically warn of the dangers of using water and actually teach away from its use in certain circumstances.

Even, arguendo, the artisan were to only look to the disclosure of Droscher et al that the Examiner relies upon (i.e., that water can act as a thermal transmitter), it is important to understand the context of which this reference is made. Specifically, in this context, water is at best used over the entire surface in the cited art. Such a use is in direct contrast with the claimed invention where the first susceptor is applied selectively by, for example, printing. Accordingly, even if Droscher et al and Lause et al are combined, the claimed invention would not be apparent to the skilled artisan.

Moreover, Claim 1 as presently amended requires that the pulverulent substrate, contains about 0.05 to about 5% by weight of a flow aid. Applicants submit that neither Droscher et al nor Lause et al disclose or suggest the presence of a flow aid in the pulverulent substrate in the amount recited. As such, for this additional reason the claimed invention is not obvious in view of the combined disclosures of Droscher et al and Lause et al.

Recognizing the foregoing deficiencies in the combined disclosures of Droscher et al and Lause et al, the Examiner now cites Zhu et al and Wills et al.

Again, in contrast to Droscher et al the different type of selectivity is decisive, or in other words the manner in which zones to be melted are separated from other zones. Among other factors, this selectivity depends on the guidance of the radiation or on the presence or

absence of a susceptor. In the present application it is not absolutely necessary that the microwave radiation be focused. Complex optics are not applicable in the present invention.

Lause et al disclose a welding process using an intermediate piece. Powder is not used for this purpose. Applicants submit that Lause et al is unrelated to the present application.

Thus, even a combination of Droscher et al and Lause et al does not lead to the presently claimed invention. For example, the application of a susceptor in an extra process step is not described in either of the references, whereas in our case this is an essential component. Furthermore, a distinction between molten zones and solid zones by selective application of the susceptor is not made in either of Droscher et al and Lause et al.

Zhu et al disclose a completely different and unrelated method. Zhu et al disclose an improvement of the free-flowing capability of powders by pouring agents. In principle, however, a pouring agent is something other than a special susceptor for microwave radiation. Zhu et al discloses only the differences in particle size and density, but not other properties. The susceptor of the present invention, however, is described as particles in a suspension/ink, which represents something other than a finely divided "dry" pouring agent.

Wills et al disclose pulverulent compositions having a high rubber content, for use as impact strength modifiers. They are populations of core-and-shell polymer particles having different particle diameters. These mixtures are used for injection-molded articles among other purposes. Again, Wills et al is unrelated to the present invention and provides no further clarification as to the deficiencies above in the other cited references.

Accordingly, Applicants submit that the combined disclosures of Droscher et al, Lause et al, Zhu et al, and Wills et al fail to render the claimed invention obvious.

Withdrawal of this ground of rejection is requested.

The rejection of Claims 6 and 7 under 35 U.S.C. §103(a) over Droscher et al in view of Lause et al and either Zhu et al or Wills et al and further in view of Narang et al is respectfully traversed.

Droscher et al, Lause et al, Zhu et al, and Wills et al are discussed above. First, Narang et al do not compensate for the aforementioned deficiencies in the combined disclosures of Droscher et al, Lause et al, Zhu et al, and Wills et al. Narang et al disclose a subsequent process, similar to tempering or curing, for which microwaves are used. However, the microwaves do not act selectively, but instead the entire component is affected. The three-dimensional shape is not formed by the microwaves, but instead the component already exists beforehand. Even though the present invention uses the microwaves at the end of the coating step in the process, in the present invention only powder is present and no component before the use of the microwaves.

Thus, Narang et al does not compensate for the deficiencies discussed above for the combined disclosures of Droscher et al, Lause et al, Zhu et al, and Wills et al and does not even support the Examiner's extended basis of rejection.

Accordingly, Applicants submit that the combined disclosures of Droscher et al, Lause et al, Zhu et al, Wills et al, and Narang et al fail to render the claimed invention obvious. Withdrawal of this ground of rejection is requested.

The rejection of Claim 11 under 35 U.S.C. §103(a) over Droscher et al in view of Lause et al and either Zhu et al or Wills et al and further in view of Sherwood is respectfully traversed.

Droscher et al, Lause et al, Zhu et al, and Wills et al are discussed above. Sherwood is only cited for allegedly disclosing the use of protic liquids in processes of making three-dimensional objects. However, Sherwood does not compensate for the aforementioned deficiencies in the combined disclosures of Droscher et al, Lause et al, Zhu et al, and Wills et al.

Accordingly, Applicants submit that the combined disclosures of Droscher et al, Lause et al, Zhu et al, Wills et al, and Sherwood fail to render the claimed invention obvious. Withdrawal of this ground of rejection is requested.

The rejection of Claims 15 and 16 under 35 U.S.C. §103(a) over Dorscher et al in view of Lause et al and either Zhu et al or Wills et al and further in view of van der Geest is respectfully traversed.

Droscher et al, Lause et al, Zhu et al, and Wills et al are discussed above. van der Geest is only cited for allegedly disclosing the use of glass beads in processes of making three-dimensional objects. However, van der Geest does not compensate for the aforementioned deficiencies in the combined disclosures of Droscher et al, Lause et al, Zhu et al, and Wills et al.

van der Geest disclose a method for the production of shaped articles. In this case a powder containing a further component is brought into contact with an aqueous liquid, thus forming a binding material (adhesive component). A heat-curing material can be used as a second binder. The individually formed and bonded powder layers can be dried by input of heat, but do not have to be. Three-dimensional objects are produced by this method, but the method differs fundamentally from the present invention. In the present invention the individual layers become bonded by fusion or sintering, but not by adhesive components. In

the present invention, the susceptor can be mixed in a liquid. This leads to better distribution of the components, but the susceptor is not a binding material. The present invention relates to a method for production of three-dimensional objects from a pulverulent substrate by binding, for example by fusing or sintering parts of the substrate, the heat energy needed for binding the substrate being generated by microwave radiation via a susceptor and being delivered by this to sub-zones of the substrate.

Accordingly, Applicants submit that the combined disclosures of Droscher et al, Lause et al, Zhu et al, Wills et al, and van der Geest fail to render the claimed invention obvious. Withdrawal of this ground of rejection is requested.

The rejection of Claims 17-19 11 under 35 U.S.C. §103(a) over Dorscher et al in view of Lause et al and either Zhu et al or Wills et al and further in view of Liu et al is respectfully traversed.

Droscher et al, Lause et al, Zhu et al, and Wills et al are discussed above. Liu et al is only cited for allegedly disclosing the use of colorants, laser-activatable additives, and coated ceratmic or metallic particles in processes of making three-dimensional objects. However, Sherwood does not compensate for the aforementioned deficiencies in the combined disclosures of Droscher et al, Lause et al, Zhu et al, and Wills et al.

Accordingly, Applicants submit that the combined disclosures of Droscher et al, Lause et al, Zhu et al, Wills et al, and Liu et al fail to render the claimed invention obvious. Withdrawal of this ground of rejection is requested.

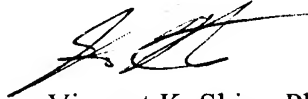
Application Serial No.: 10/799,874

Reply to Office Action of: September 29, 2008

Applicants submit that the application is now ready for allowance, and early notification of such action is earnestly solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon

A handwritten signature in black ink, appearing to read 'V. Shier', with a long horizontal flourish extending to the right.

Vincent K. Shier, Ph.D.
Registration No. 50,552

Customer Number

22850

Tel: (703) 413-3000

Fax: (703) 413-2220

(OSMMN 08/03)